Maria Asplund

Biography

Maria Asplund is professor in Bioelectronic Microtechnology at Chalmers University of Technology where her research includes flexible neurotechnology, tissue-device interaction and electronic biomaterials. After completing her PhD at the Royal Institute of Technology (Stockholm, 2009) she led her own research group at the University of Freiburg (2011-22), and in 2022 proceeded to her professorship at Chalmers (Gothenburg, Sweden). Her team specializes in implant nano- and micromanufacturing for bioelectronic applications, reaching from wound repair to brain implants for visual restoration. She has also worked extensively within electronic materials for safe and efficient charge injection over the entire parametric range used clinically. Maria Asplund has won multiple prestigious grants including ERC starting and proof of concept grants, and the Swedish Research Council. She is currently Director of the Chalmers Area of Advance in Health Engineering, an editor of Journal of Neural Engineering and of Bioelectronic Medicine, and co-founder of Bioelectrix Sweden.

BIOMATERIALS, MICRO- AND NANOTECHNOLOGY FOR BIOELECTRIC STIMULATION

Maria Asplund
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Many bioelectronic applications relies on that current can be delivered effectively, in exactly the right location, with predictable and controllable current spread and generate a reproducible response over time. All of this requires engineering on the micro- and nanoscale and meticulous attention to the interaction of materials and with tissue. The most recent advances in neurotechnology focused on minimizing implant volume, while increasing the number of integrated electrodes and connection lines, and ensuring soft and flexible properties. Miniaturization is a technical feasibility thanks to direct writing techniques, including laser and e-beam lithography. In my talk, I will showcase our most recent work and learnings when advancing towards sub-micron scale engineering of flexible thin-film devices. Compact integration also raises new challenges, making it essential to analyze which limitations the physical properties of the included materials pose on e.g. impedance, resilience and crosstalk, and in turn the influence on the outcome of the in vivo experiment. We need to be certain that the intended stimulation reaches the target and generate the same effect at every point in time. In my talk I will share the different aspects of precision stimulation that we have explored, and how better understanding of materials physics and electrochemistry guide us towards more effective and reliable neurotechnology in the future. I will also show how stimulation may contribute to novel application domains including spinal cord stimulation with implications for improved functional regeneration.